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Tamarack in Indiana.

Since writing my paper on the "Origin of the Flora of Indiana," I have received through Prof. Coulter a specimen of wood from Johnson county, in the southern part of this state, which proved to be Larix Americana. This wood was found buried in the blue clay underlying the glacial drift, and had been so well preserved that one would easily distinguish it as a conifer at sight, while its tissue structure was readily recognized as that of L. Americana. I have also heard of other cases in which pieces apparently of the same species have been found in various similar situations throughout the southern part of the state. Now we have only a very few in exceedingly favorable places in extreme northern counties. Prof. Heer found at least some of its near congeners among the specimens from the cretaceous rocks of Arctic North America. These facts help confirm the conclusion that our flora originated in the far north, was driven south during the glacial period and again north during subsequent periods, and distributed as we now find it. H. THOMSON.

Crawfordsville, Ind.

The Fertilization of Campanula Americana.

In a paper under this title read before the A. A. A. S., and published in this journal (Vol. x. p. 349), I described the introversion of the hairs on the style, and referred to Strasburger's confirmatory account of C. rapunculoides, in which, however, he gives no indication that the matter had previously been worked out in another species. My attention has been called to a paper by W. Wilson, entitled "Further remarks on the pollen-collectors of Campanula," etc., in Hooker's *Journal of Botany*, vii (1848). 92. Respecting C. rotundifolia Mr. Wilson says: "The hairs . . . . are simply *pollen-collectors*, and nothing more; they discharge this function admirably; and having performed it they retire, each within its own cell, by virtue, I suppose, of some action of exosmosis. . . . . The whole of the exserted hair is retracted into its base which forms an embedded cavity in the substance of the style." While this matter is only incidentally mentioned in my paper, it is proper that credit be given to Wilson for an observation far antedating Strasburger's and mine. Thus do we, for lack of knowing what has been done, grind over and over the same grist. C. R. BARNES.

Cambridge, Mass.

CURRENT LITERATURE.

Report of the Botanist to the New York Agricultural Experiment Station. By J. C. Arthur. Extracted from the third annual report for 1884, pp. 353-385, and from fourth annual report for 1885, pp. 241-265. 8°.

Professor Arthur was appointed botanist to the New York Agricultural Experiment Station in March, 1884. These two reports embrace the results of his investigations for the years 1884 and 1885. These have been mostly confined to the investigation of fungous diseases, and especially those of cultivated plants. The great importance of this line of study is evident to all who know anything of the magnitude of the losses incurred by fungous parasites. Four introductory pages of the first report are occupied with a statement of the nature and habits of fungi, following which are the details of various experiments with several injurious species. The list of investigations includes diseases of the pear, apple, quince, peach, tomato, oats, and other plants of the field and garden. The investigations upon the pear blight appropriately take a leading place in both reports, and as this work has been of such importance as to attract the notice of the general press of the country, it is only necessary to here state that the cause of pear blight has been demonstrated to the satisfaction of those who are most familiar with the subject. This destructive blight is due to *Micrococcus amylovorus* B., a bacterium discovered by Professor Burrill a few years ago, in connection with pear and apple blight. The minute germs find entrance to the tree through the tender surfaces of flowers and young twigs in spring time and then multiply, producing the familiar burned appearance of the leaves and twigs in mid-summer. By a careful filtration of the juices accompanying the bacteria, and by a long series of cultures in the usual way for the elimination of all foreign matter, it was demonstrated that the cause of the blight resides with the bacterium germ and not in the enveloping liquid. It was a happy thought that led to the innoculation of the very susceptible flesh of the growing fruit, and it serves as a hint to all investigators that they should seek for every possible advantage in applying their tests. It remains for the fungicide to be found. If some otherwise harmless chemical will prove effective, it seems that with this additional discovery the work of the scientists in this case would be fairly completed. Until such remedy is found the old one of the knife used upon all discolored branches should be vigorously applied. The blight of the apple and quince are of the same origin and require the same treatment.

Professor Arthur has made observations on another blight or scab, *Fusicladium pyrinum* Fckl., that works upon the leaf of the pear. Another species of the same genus, *F. dendriticum* Fckl., works in like manner upon the apple leaves covering them with rusty spots, and upon the fruit, sometimes causing much damage.

The amount of smutted grain in an ordinary field of oats was carefully determined to be nine and one-half per cent. This strikingly points to the fact that doubtless the loss of grain from smut is greater than generally supposed. Much of the smutted grain is overlooked by the ordinary observer.

The lettuce rust and mildew have both been subjects of investigation, and both are illustrated with engravings. The rust, *Septoria Lactucæ* Pass., causes the lettuce leaves to turn brown and become unfit for use. Experiments with fungicide as yet have developed no satisfactory remedy. The mildew, *Peronospora gangliformis* DeB., is a genuine rot and a close relative of the potato rot. The wild lettuce is a natural propagating bed for this disease and should be eradicated wherever found.

Extensive investigations have been made upon the rotting of cherries and plums, caused by *Oidium fructigenum* S. & K. This fungus passes the winter in decayed fruits that frequently remain hanging to the trees. Sowings of the fungus spores upon the flowers of cherries quickly produced the rot in the young fruits. The disease spreads rapidly from fruit to fruit when the latter are in contact, and there is little doubt that the mycelium has the power of penetrating the fruit skin, though some writers hold that they can only pass through stomata, or ruptures in the fruit. It has been stated by Von Thümen and others that this fungus acts as an antiseptic. This impression may arise from the fact that when it has coated the surface of a fruit, it excludes the entrance of more active putrefying germs, as those of bacteria. Professor Arthur's experiments lead him to as extreme a view of the case as the following, which we give in his own words: "Doubtless such destructive species as the Peronosporæ of potato-rot and lettuce-rot are not the direct cause of the offensive putrefaction, but it is due to the bacteria associated with them. We very properly hold the higher fungus accountable for the result, however, for it first produces by its growth those chemical products upon which the bacteria are able to thrive. . . . . The inability of the usual putrefactive bacteria to overcome the resistance of the living cells and start decay, has been well illustrated by numerous experiments performed in connection with other topics, and particularly by the ineffectual inoculation of green tomatoes with bacteria taken from a rotting fruit in which were only bacteria and fungous mycelium." The remedy suggested for the serious rotting of fruits is the destruction of all decaying fruit, whenever and wherever found. When practicable hogs should run under the trees.

In *Entomophthora Phytonomi* Arthur we have a new species of fungus that is welcomed to a place among those forms preying upon destructive insects, and are therefore friends of the farmer and gardener. This fungus, the life history of which, as far as known, is described and illustrated in the report, infests the bodies of the clover-leaf weevil (*Phytonomus punctatus* Fabr.), causing the host insects to die. The behavior of the ravaged weevils and the methods of dispersing the spores of the fungus are particularly interesting.

In conclusion, Professor Arthur tabulates the weeds and the number of each which grew upon one-twentieth of an acre of plowed and otherwise unoccupied land during 1885. To this subject is added notes upon some of the fungi that prey upon weeds—a list of friends, when they confine themselves to undesirable hosts, as the Canada thistle, pig-weed and purslane. We hope to see an annual contribution to our limited fund of knowledge of plant diseases from Professor Arthur for many years to come. Many of his subjects demand continuous investigation through several seasons. BYRON D. HALSTED.

Text-Book of General Botany. By Dr. W. J. Behrens. Translated fromt he 2d German edition. Revised by Patrick Geddes. 8°, pp. viii, 374. Edinburgh: Young J. Pentland. 1885.

Germany has produced many text-books of botany, of all grades of excellence, and several of them have been honored by an English translation. We are more than willing to acknowledge Germany's leading position in botany, but why this special text-book was selected for translation we can not discover. Not that there is anything bad in the book itself, for it is a good book of its kind, but there is nothing about it of such surpassing excellence that it should deserve this high compliment. The translation, in this view, simply seems unnecessary. The book is welcomed to every botanist's library, not because of its excellence as a text-book, but it gives profuse and most excellent illustrations, new statements of old facts, many new illustrations of facts, in short, just such a book as one likes to consult now and then in "working up" a subject.

It is divided into five parts, with no sub-divisions into chapters, and strikes one as being out of proportion for a "Text-book of General Botany." Part I deals with Morphology in about 100 pages, the plant organs being considered under the four heads of root, stem, leaf, and hairs. Part II, with about 60 pages, is devoted to Systematic Botany. Here the American student will be lost, and maybe he ought to be. The classification adopted is of course German, and probably more nearly expresses natural relationships than the confessedly artificial grouping that we use. But this aside, all this systematic presentation of orders in a "text-book" is so much barren waste, so far as class work is concerned. It reduces that part of the book to reference rather than to reading. Part III, with 70 pages, bears the title of Physiological Botany, but is all devoted to flowers and insects. It occurs to us that this title is a misnomer, and the space occupied by this very interesting subject is out of all proportion to the rest of the book. When one looks for a description of the process of "fecundation," he is met with the primitive statement that the pollen grain contains protoplasm, and that the embryo-sac is a cavity in the ovule filled with fluid (p. 168), and that the "mingling of the contents of the pollen-tube with those of the embryo-sac is the essential feature of the process of fecundation." It must be said that the subject of cross-pollination is beautifully worked out, both in illustrations and text. Part IV contains about 80 pages, and is entitled Anatomy and Physiology, though it would be hard to explain why one part is called Physiological Botany and another Physiology, although the former only deals with insects and flowers. At the opening of this part we are treated to an anomalous thing. Here, towards the end of the book, under anatomy and physiology, we encounter an introduction to the study of botany, giving its scope, its history, etc., with brief biographical sketches of the older systematists, followed by others who were physiologists. Some 30 pages is given to a good and finely illustrated discussion of the cell. After this, the subject of "histology" is taken up, though why the study of cells would not come under that head it would be hard to guess. Then to physiology proper 10 pages are given! There can surely be no excuse for so reducing this great subject in a general text-book. Part V, with 40 pages, is entitled "The Lower Plants," under which title are grouped both cryptogams and phanerogams with their subdivisions, chief attention being given to the former. What mycologists will say to the following groups as correlatives is not hard to guess: protophytes, fungi, algæ, liverworts, mosses, ferns, horsetails, rhizocarps, clubmosses, conifers, monocotyledons, and dicotyledons. It is said that except in the protophytes spores are "the product of sexual conjugation," and that they are "destitute of an embryo having plumule, radicle, and cotyledons," though what their embryo does have is not said. So then, under the comprehensive title, "Systematic Botany," we have grouped only the phanerogams, while under the restricted title, "The Lower Plants," we have all plants grouped.

How much of this is due to the translator we have no means of judging. Our frank opinion, then, with respect to the book, is that it lacks perspective, proportion, arrangement, and proper titles; while it does have an abundance of capital illustrations and much most excellent information presented in an interesting way. While, therefore, it can never be considered a good "Text-Book of General Botany," as a treatise on botany it will find a place on our shelves and be frequently consulted.

Plant Life on the Farm. By Maxwell T. Masters, M. D., F. R. S. 16°, pp. iv, 132. New York: Orange Judd Company. 1885.

This little book is a step in the right direction. It is high time that our cultivators should be informed of some of the most important facts of physiological botany. They may be well informed about the structure of plants, for we have many good books treating of this subject, but simple and concise books upon how plants live are very few, and no department of botany can be more important to those whose whole occupation is to cultivate plants. The class addressed has neither time nor training to master and apply all the details of this subject, nor is it of practical importance that it should, but, as the author says, "experience shows the increasing necessity of furnishing him (the cultivator) with new tools and new weapons to enable him to utilize the resources of nature, and to contend against adverse circumstances. It is the object of this book to point out these resources and suggest methods of utilizing them." The subjects of the nine chapters are very suggestive, and treated, as they are, in a simple yet scientific way, give to the reader a fair knowledge of the life work of plants. The subjects are: Plant Nutrition, the work and the materials; Nutrition, the machinery; Growth; Sensitiveness; Development; Multiplication; The Battle of Life; Practical Inferences; Decay and Death. It is a good thing for science when some leading worker stops long enough to teach common people a few things that are useful for them to know. The other alternative is to leave it to quacks and professional book-makers who do it so badly that it had better not be done at all. Dr. Masters has been able to draw upon a great fund of experiments furnished by the famous experiment station at Rothamsted. A good point is made in trying to get the cultivator to understand how important to his own work is that of the microscopist and chemist, as the "life-history of a plant is, in essence, the life-history of protoplasm and of its covering the cell-wall," a thing which the "practical man" finds it difficult to realize. The author, of necessity, touches upon some very difficult problems, but is wise in not confusing his readers by discussing them, although properly leaving the impression that they are not fully understood, as for instance the function of chlorophyll, p. 28. Most of the definitions are very clear, when one considers that they are made for those with no basis of technical knowledge. Exception might be taken to the following, however, p. 49, where the exogenous stem is said to have woody bundles made of "wood-cells" and "bast cells," and on the "*outer side of each bundle* is a thin layer of cambium." On the same page the endogens are said to have "their cambium tissue in the center of each bundle." A difference of opinion might also be held in reference to the statements on page 87, that "cross-fertilization secures variation," and self-fertilization represses it. We can cordially recommend the book, not only to the practical cultivator, but also to botanists, many of whom know far too little of the principles of physiological botany.

On the Structure of the Testa of Several Leguminous Seeds. By **L. H. Pammel.** Extracted from the Bullitin of the Torrey Botanical Club. Vol. xiii (1886), pp. 17–24, t. 2.

In this brochure, Mr. Pammel describes the structure of the seed coats of Phaseolus vulgaris, Gymnocladus Canadensis, Physostigma venenosum and Mucuna urens. The structure of the very hard seed-coats he finds quite homologous with that of less resistant ones, differing chiefly in the greater development of sclerenchyma cells which are commonly present. The work has been carefully done, and much of the extensive literature regarding leguminous seed-coats is cited by the author.

NOTES AND NEWS.

THE GERMAN imperial government has ordered the establishment of chairs of bacteriology at all universities of the empire.

THE PAPER of Dr. W. Pfeffer on intramolecular respiration, noticed in the March GAZETTE, is taken, as we are informed by Dr. N. L. Britton, from *Untersuchungen des botanischen Instituts in Tübingen*, vol. i.

THE ENUMERATION of the species of the genus Phyllosticta by George Martin is terminated in the March number of the *Journal of Mycology.* It includes seventy species, found upon sixty-four species of host plants.

EXTENSIVE BACTERIOLOGICAL studies are now carried on at the U. S. Army and Medical Museum at Washington. The most recent apparatus and methods are used, and the facilities are considered quite equal to those of German laboratories.

THE FOLLOWING new grasses are described by Dr. Geo. Vasey in the *Bulletin of the Torrey Club* for February: Panicum Nealleyi, Imperata brevifolia, Aristida Arizonica, A. Harvardii, and A. Orcuttiana. Seven new varieties belongingto other species are also described.

EDOUARD MORREN, the well-known professor of botany in the University of Liége, vice-president of the Royal Botanical Society of Belgium, editor of *Belgique Horticole* and of *Correspondance Botanique,* died on the 28th of February last, at the age of 52 years.

IN ANSWER to an enquiry, Professor Gray informs us that he is not quite disposed to place on sale copies of his papers in the American Academy's Proceedings and elsewhere, especially as he pretty freely presents them to his principal correspondents, so that there are not very many left over. Still, to oblige those whom he has to overlook or can not keep the run of, and to recover a portion of the cost, he has arranged that orders for them addressed to the curator of the Herbarium of Harvard University will as far as possible be filled, at the rate of thirty-five cents for each paper.

W. C. WALKER, F. R. M. S., of Utica, and H. H. Chase, M. D., of Geneva, N. Y.. have issued a fascicle of eight quarto pages and two plates dealing with some new and rare diatoms. Twenty-two species are mentioned, all of which are figured. Of the forms marked as new five species are by Mr. Walker, two species and two varieties by Dr. Chase, two species by Prof. H. L. Smith, one species by Mr. E. S. Nott, and one variety by Mr. B. W. Thomas. The plates are photographs from free-hand drawings by Mr. Walker, and are fine examples of this kind of work. We suppose it is by a slip that the figures are said to be magnified 400 diameters, for being free-hand they must necessarily be variable. We are informed that this is to be followed by other numbers.